

What is claimed is:

1. A multi-air conditioner comprising:

an outdoor unit installed at an outdoor location, and having therein a compressor and an outdoor heat exchanger;

5 a plurality of indoor units respectively installed at indoor rooms, each of the indoor units having therein an electronic expansion valve and an indoor heat exchanger;

a distributor provided between the outdoor unit and the plurality of indoor units, for selectively guiding a refrigerant
10 introduced from the outdoor unit to the plurality of indoor units according to an operation condition;

a four-way valve provided on a discharge side of the compressor, for selectively switching a flow direction of the refrigerant flowing through the outdoor heat exchanger;

15 a first connection pipe branched from a pipe connecting an absorbing side of the compressor with the four-way valve, for connecting the distributor to guide the refrigerant;

a second connection pipe branched from a pipe connecting the discharge side of the compressor with the four-way valve, for
20 connecting the distributor to guide the refrigerant;

a third connection pipe for connecting the outdoor heat exchanger with the distributor to guide the refrigerant; and

a selective expansion apparatus provided on the third connection pipe and including a heating electronic expansion unit for selectively expanding the refrigerant.

5 2. The multi-air conditioner of claim 1, wherein the four-way valve comprises three outlets respectively connected with the discharge outlet/the absorbing inlet of the compressor, and the outdoor heat exchanger, and one outlet, which is closed.

10 3. The multi-air conditioner of claim 2, wherein the four-way valve selectively switches between a first connection state in which the discharge outlet of the compressor is connected with the outdoor heat exchanger and the absorbing inlet of the compressor is connected with the closed outlet of the four-way
15 valve, and a second connection state in which the discharge outlet of the compressor is connected with the closed inlet of the four-way valve and the absorbing inlet of the compressor is connected with the outdoor heat exchanger.

20 4. The multi-air conditioner of claim 1, wherein the selective expansion apparatus comprises:

a check valve for passing the refrigerant flowing out of the outdoor heat exchanger and cutting-off the refrigerant introduced into the outdoor heat exchanger;

a parallel pipe respectively branched from a front end and a rear end of the check valve and provided in parallel with the check valve; and

a first electronic expansion valve provided on the parallel
5 pipe.

5. The multi-air conditioner of claim 1, wherein the refrigerant flowing through the first connection pipe is maintained in a state of a low pressure/vapor phase, the
10 refrigerant flowing through the second connection pipe is maintained in a state of a high pressure/vapor phase, and the refrigerant flowing through the third connection pipe is maintained in a state of a high pressure/liquid phase.

15 6. The multi-air conditioner of claim 1, wherein the compressor comprises a plurality of compressors connected in parallel with each other, for performing compression operation.

7. The multi-air conditioner of claim 1, wherein the
20 absorbing inlet of the compressor further comprises an accumulator.

8. The multi-air conditioner of claim 4, wherein the distributor comprises:

a guide pipe part for guiding the refrigerant introduced from the outdoor unit to the respective indoor units through the second connection pipe or the third connection pipe, and guiding the refrigerant heat-exchanged in the respective indoor units to the outdoor unit through the first connection pipe or the third connection pipe; and

a valve part for controlling a flow of the refrigerant in the guide pipe part such that the refrigerant is selectively introduced into the respective indoor unit according to the operation condition.

9. The multi-air conditioner of claim 8, wherein the guide pipe part comprises:

a first vapor pipe connected with the first connection pipe, for guiding the low pressure/vapor-phase refrigerant;

first vapor divergent pipes branched from the first vapor pipe and connected to the respective indoor units;

a second vapor pipe connected with the second connection pipe, for guiding the high pressure/vapor-phase refrigerant;

second vapor divergent pipes branched from the second vapor pipe and connected to the respective indoor units;

a by-pass pipe connecting the second connection pipe with the first vapor pipe;

a liquid pipe connected with the third connection pipe, for guiding the high pressure/liquid-phase refrigerant; and

liquid divergent pipes branched from the liquid pipe and connected to the respective indoor units.

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10. The multi-air conditioner of claim 9, wherein the valve part comprises:

a second electronic expansion valve for preventing the refrigerant supplied into the by-pass pipe from being liquefied;

10 and

a two-way valve provided on each of the first vapor divergent pipes and the second vapor divergent pipes, and turned on or off according to the operation condition.

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11. The multi-air conditioner of claim 9, wherein the electronic expansion valve provided on each of the indoor units is provided on the liquid divergent pipe.

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12. The multi-air conditioner of claim 9, wherein the distributor comprises a plurality of distributors provided for easy installation of each of the indoor units.

13. The multi-air conditioner of claim 12, wherein the first vapor pipe of each of the distributors is connected with

the first connection pipe of the outdoor unit, the second vapor pipe of each of the distributors is connected with the second connection pipe of the outdoor unit, and the liquid pipe of each of the distributors is connected with the third connection pipe.

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14. The multi-air conditioner of claim 10, wherein in case the indoor units all operate in the cooling mode or in case the majority of indoor units operate in the cooling mode while the rest operate in the heating mode, the four-way valve is switched
10 to connect the outlet of the compressor with the outdoor heat exchanger and to connect the inlet of the compressor with the closed inlet of the four-way valve.

15. The multi-air conditioner of claim 14, wherein in case
15 the indoor units all operate in the cooling mode, the first electronic expansion valve is closed and the second electronic expansion valve is operated, the electronic expansion valves connected with all the indoor units is operated, the two-way valves provided on the first vapor divergent pipe are all closed,
20 and the two-way valves provided on the second vapor divergent pipe are all closed.

16. The multi-air conditioner of claim 14, wherein in case the majority of indoor units operate in the cooling mode while the rest operates in the heating mode,

the first and second electronic expansion valves are closed,

5 in case of the indoor units operating in the cooling mode, the electronic expansion valves connected to the indoor heat exchangers are operated, the two-way valves provided on the first vapor divergent pipes are opened, and the two-way valves provided on the second vapor divergent pipes are closed, and

10 in case of the indoor units operating in the heating mode, the electronic expansion valves connected to the indoor heat exchangers are opened, and the two-way valves provided on the first vapor divergent pipes are closed, and the two-way valves provided on the second vapor divergent pipes are opened.

15 17. The multi-air conditioner of claim 10, wherein in case the indoor units all operate in the heating mode, or in case the majority of indoor units operate in the heating mode while the rest operates in the cooling mode,

20 the four-way valves are switched to connect the outlet of the compressor with the closed inlet of the four-way valve and to connect the inlet of the compressor with the outdoor heat exchanger.

18. The multi-air conditioner of claim 17, wherein in case the indoor units all operate in the heating mode,

the first electronic expansion valve is operated, the second electronic expansion valve is closed, the electronic expansion valves connected with all the indoor units are opened, the two-way valves provided on the first vapor divergent pipe are all closed, and the two-way valves provided on the second vapor divergent pipe are all opened.

19. The multi-air conditioner of claim 17, wherein in case the majority of indoor units operate in the heating mode while the rest operates in the cooling mode,

the first electronic expansion valve is operated and the second electronic expansion valve is closed,

in case of the indoor units operating in the heating mode, the electronic expansion valves connected to the indoor heat exchangers are opened, the two-way valves provided on the first vapor divergent pipes are closed, and the two-way valves provided on the second vapor divergent pipes are opened, and

in case of the indoor units operating in the cooling mode, the electronic expansion valves connected to the indoor heat exchangers are operated, the two-way valves provided on the first vapor divergent pipes are opened, and the two-way valves provided on the second vapor divergent pipes are closed.

20. An operation method of a multi-air conditioner, the method comprising the steps of:

in case indoor units all operate in a cooling mode, or in
5 case a majority of indoor units operate in the cooling mode while the rest operate in a heating mode, switching a four-way valve such that a refrigerant discharged from a compressor passes through an outdoor heat exchanger; and

closing a first electronic expansion valve provided on a
10 selective expansion apparatus to guide the refrigerant condensed in the outdoor heat exchanger to a distributor, and

in case the indoor units all operate in the heating mode, or in case the majority of indoor units operate in the heating mode while the rest operate in the cooling mode,

15 switching the four-way valve such that refrigerant discharged from the compressor is introduced into the distributor; and

operating the first electronic expansion valve provided on the selective expansion apparatus to expand the refrigerant
20 introduced into the outdoor heat exchanger from the distributor.